

REMARKS/ARGUMENTS

This is a Response to the Final Office Action mailed October 20, 2004, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire January 20, 2005. Forty-three (43) claims, including twelve (12) independent claims, were paid for in the application. No claims are canceled. Claims 5, 14, 29, and 33 are amended. No new matter has been added to the application. No fee for additional claims is due by way of this Amendment. The Director is authorized to charge any fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090. Claims 2-20, 22, 27, 29-34, 36-38, 40-41 and 43 are pending.

Applicants thank the Examiner for allowing claims 11-13, 16-20, 22 and 38, and for noting that claims 7, 8 and 32 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

The Examiner has made the Office Action final, suggesting that new grounds of rejection were necessitated by the previous amendments. Applications respectfully traverse such, and request that the Examiner reconsider and withdraw the finality of the rejection as being premature, per MPEP §§706.07(e), 706.07(d). "Under present practice, second or any subsequent actions on the merits shall be final, *except* where the examiner introduces a new ground of rejection that is neither *necessitated by applicant's amendment* or the claims nor based on information submitted in an information disclosure statement filed during the period set forth in 37 C.F.R. 1.97(c)." MPEP §706.07(a) (emphasis added).

In particular, except for claims 29 and 30, the previous amendments simply placed the claims in independent form. Thus, the previous amendments did *not* insert any new limitations to the claims, and could thus *not* provide any basis for requiring new grounds of rejection. With respect to claims 29 and 30, in addition to rewriting claim 29 in independent form, the previous amendments simply corrected antecedent basis problems. Again, the previous amendments did *not* introduce any new limitations or provide any other basis for requiring a new ground of rejection.

Rejections Under 35 U.S.C. §102

Claims 14 and 33 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,569,549 to Sawyer (hereinafter Sawyer).

In the interest of brevity, Applicants will not repeat the explanations and argument made in the prior response, but rely on that response where appropriate.

Replying to Applicants' previous response, the Examiner noted that the claims do not specify that the current must be measured repeatedly or that each purge duration is separately determined based on an individual measurement. Applicants have amended claims 14 and 33 to more clearly state that the current flow on which the purge duration is based in those claims, as well as in claims 5 and 29, is the actual current flow as determined from time-to-time during operation, rather than some theoretical value of current density concretely predetermined during design of the fuel cell system.

In particular, as amended claim 14 recites, *inter alia*, "a controller coupled to provide control signals to the actuator to open the purge valve when a fuel cell stack purge condition exists and to close the purge valve after a purge duration determined based on a flow of current through the fuel cell stack *measured after a previous closing of the purge valve.*" (Emphasis added.)

As amended, claim 33 recites, *inter alia*, "*from time-to-time during operation, determining a current flow through a fuel cell stack; from time-to-time during operation, determining a purge duration based at least in part on a most recent of the determined current flows; . . . closing the purge valve after the purge valve has been open for a most recently determined one of the determined purge durations.*" (Emphasis added.)

As discussed in the prior response, Sawyer teaches optimizing fuel cell performance by timed dead-ended operation, and by providing a one-to-one correspondence between the occurrence of a triggering condition and an opening of a purge valve. Sawyer teaches that the opening of the purge valve is for a single pulse of a predetermined duration. *Sawyer*, col. 4, lines 10-11; col. 6, lines 33-39; col. 6, lines 57-65. While Sawyer teaches the duration of this purge pulse is to be determined by the length of time required for a sufficient volume to be purged, *Sawyer*, col. 6, lines 33-39, it is clear that this length of time is to be "concretely established" by experimentation or analysis when designing the system. *Sawyer*, col. 6, lines 57-65. Thus, Sawyer does not teach closing the purge valve after a purge duration determined based on a flow of current through the fuel cell stack *measured after a previous closing of the purge valve* as recited by claim 14. Likewise, Sawyer does not teach closing the

purge valve after the purge valve has been open for *a most recently determined one of the* determined purge durations, as recited by claim 33.

Rejections Under 35 U.S.C. § 103

Claims 36 and 41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sawyer.

The Examiner states that the reference does not expressly teach that the purge valve is opened during a shutdown of the fuel cell stack, as recited in claim 36, or that the controller contains a computer-readable media containing instructions for causing a processor to control the fuel cell system as recited in claim 41. Yet, the Examiner concludes that it would have obvious to one of ordinary skill to open the purge valve of Sawyer during shutdown of the fuel cell stack since such a purging would leave the system in a state more conducive to starting up, *i.e.* the system would be ready to be started up.

To establish a *prima facie* case of obviousness, there must be: (1) some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) a reasonable expectation of success; and (3) the prior art reference(s) must teach or suggest all the claim limitations. MPEP 2142. To support a conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claim invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” MPEP 2142, citing *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

The teaching or suggestion and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. MPEP 2142, citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. MPEP2143.01

As noted above there is no explicit support in the references for the stated approach (*i.e.*, purging during shutdown) or the stated motivation (*i.e.*, the system would be ready to be started up). Likewise, there appears to be no implicit support in the references for the stated approach (*i.e.*, purging during shutdown) or the stated motivation (*i.e.*, the system would be ready to be started up). Thus, in making the obviousness rejection, the Examiner appears to be relying on the purported knowledge generally available to one of ordinary skill in the art.

However, the fact that a reference can be modified is not sufficient to establish a *prima facie* obviousness MPEP 2143.01 citing *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). For example, if the proposed modification of the prior art would change the principal of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP2134.01, citing *In re Ratti*, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).

In this respect Sawyer is principally directed to increasing operational efficiency by *minimizing the loss of unspent fuel*. In particular, Sawyer teaches dead ended operation (*i.e.*, re-circulating partially spent hydrogen) of the fuel cell stack, interspersed with purges (according to Sawyer, the provision of sufficient pure hydrogen to purge anode and exit manifold, see col. 7, lines 48-55, and col. 6, lines 32-39). However, performing a purge at shutdown as suggested by the Examiner is directly counter to the teachings of Sawyer, since such would purge, and thereby waste, unspent fuel. Thus, the purported modification discounts the principal of operation taught by Sawyer.

The strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principals . . . that some advantage or expected beneficial result would have been produced by their combination. MPEP2144, citing *In re Sernaker*, 702 F.2d 989, 994-95, 217 USPQ 1, 5-6 (Fed. Cir. 1983). The advantage suggested by the Examiner of performing a purge during shutdown is that the system would be ready for startup. However, where the system performs a purge on startup as taught by Sawyer, performing a purge at shutdown would be redundant, and no advantage would be obtained. The only way to obtain the purported advantage would be to further modify the teachings so as to not perform the purge during startup. There is simply no support or suggestion for making such a further modification to the clear teachings of Sawyer. Further, as suggested above, purging the anode and exhaust manifold

during both startup and shutdown would waste fuel, in direct contradiction to the explicit teachings of Sawyer. Thus, Sawyer actually teaches away from the suggested modification.

Claim 40 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 3,935,028 to Strasser et al. (hereinafter Strasser).

In rejecting claim 40, the Examiner states that the reference does not expressly teach that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage as recited by claim 40, but concludes that one of ordinary skill in the art would be motivated to close the purge valve as quickly as possible in the hope of not purging viable reactant material out of the system, while still obtaining a sufficient voltage rise. However, if one of skill in the art wished to minimize the purging of reactant while obtaining a sufficient voltage rise, they would *necessarily* select the same first defined percentage of the average fuel cell voltage as the threshold, since this would be the bare minimum purge that would meet the threshold voltage condition. Thus, there is no support or motivation in the references for “closing the purge valve when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage” as recited by claim 40.

Claims 2-6, 9, 10, 15, 27, 29, 30, 31 and 34 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sawyer in view of Strasser.

As amended, claim 5 recites, *inter alia*, “a controller coupled to provide control signals to the actuator to open the purge valve when an average voltage across the purge cell portion of the fuel cell stack falls below a defined first percentage of a threshold voltage measured across the at least two fuel cells wherein the controller is further coupled to provide control signals to the actuator to close the purge valve after a determined purge duration has elapsed, the determination of purge duration being based on a flow of current through the fuel cell stack *measured after a previous closing of the purge valve.*” (Emphasis added.)

As discussed above in reference to claims 14 and 33, Sawyer does not teach or suggest basing the purge duration on the actual current flow through fuel cell stack, as opposed to some theoretical concretely predetermined current density.

Claims 2-4 and 6-10 are allowable for the reasons stated in the previous response and also because each of the claims depends directly or indirectly from claim 5.

Claim 15 is allowable for the reasons stated in the previous response and also because claim 15 depends from claim 14.

As amended, claim 29 recites, *inter alia*, “from time-to-time, determining a current flow through the fuel cell stack; from time-to-time, determining a purge duration based at least in part on a most recent of the determined current flows; and closing the purge valve following a most recently determined one of the determined purge durations after opening the purge valve.”

As discussed above in reference to claims 14 and 33, Sawyer does not teach or suggest basing the purge duration on the actual current flow through fuel cell stack, as opposed to some theoretical concretely predetermined current density.

Claims 27 and 30-32 are allowable for the reasons stated in the previous response and also because claim 27 depends from claim 29.

Claims 37 and 43 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sawyer in further view of Strasser.

Claim 37 is allowable based on the dependency from claim 36, the rejection of which was addressed above.

Claim 43 recites, *inter alia*, “opening the purge valve for a shutdown purge duration during a stopping state at an end of operation of the fuel cell stack.”

As discussed above in reference to claim 36, there is simply no support in the references for the stated approach (*i.e.*, purging during shutdown) or the stated motivation (the system would be ready to be started up). As explained above, Sawyer in fact teaches away from such.

### Conclusion


Overall, the cited references do not singly, or in any motivated combination, teach or suggest the claimed features of the embodiments recited in independent claims 5, 11, 14, 16, 29, 33, 36, 38, 40-41 and 43, and thus such claims are allowable. Because the remaining claims depend from the allowable independent claims, and also because they include additional limitations, such claims are likewise allowable. If the undersigned attorney has overlooked a relevant teaching in any of the references, the Examiner is requested to point out specifically where such teaching may be found.

In light of the above amendments and remarks, Applicants respectfully submit that all pending claims are allowable. Applicants, therefore, respectfully request that the

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Examiner reconsider this application and timely allow all pending claims. Examiner Crepeau is encouraged to contact Mr. Abramonte by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, he is encouraged to contact Mr. Abramonte by telephone to expediently correct such informalities.

Respectfully submitted,  
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